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Filed: 4-20-99

Sponsored by: Rhodes

COUNCIL BILL NO. 99-168 RESOLUTION NO. 8648

A RESOLUTION

ADOPTING a Water Quality Protection Policy for the Fulbright Spring, Pierson Creek, and sinkhole watersheds. (The Water Resources Task Force recommends approval.)

WHEREAS, the Fulbright and Pierson Creek watersheds have been identified as valuable water resources and sources of our community's water supply; and

WHEREAS, the karst topography of this region directly connects sinkholes to the shallow groundwater system that supports the springs in this region.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGFIELD as follows:

That the City Council of the City of Springfield, Missouri, hereby adopts Exhibit A as the Water Quality Protection Policy for the Fulbright Spring, Pierson Creek, and sinkhole watersheds.

Passed at meeting: April 26, 1999

/S/ Leland L. Jarrraway
Mayor

Attest: Linda M Cirtin, City Clerk

Approved as to form: _____, City Attorney

Approved for Council action: _____, City Manager

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WATER QUALITY PROTECTION POLICY
for
Fulbright Spring, Pierson Creek, and Sinkhole Watersheds

PURPOSE

The Greene County Northeast Development Plan identifies Fulbright Spring and Pierson Creek as valuable water resources which are also sources of our community's water supply. The Northeast Plan, as well as the Short Range Recommendations of the Water Resources Task Force, calls for protection of these valuable water resources by implementing the recommendations of the 1995 Fulbright Spring Protection Study. This policy covers the design of Best Management Practices (BMP's)to minimize the effects of urban storm water runoff on the quality of receiving waters and applies to all development within the city limits of Springfield within the Fulbright Spring and Pierson Creek watersheds and any new developments which drain to a sinkhole.

It is recognized that specific water quality standards, other than those contained in the Missouri Clean Water Laws, have not been developed or adopted for these receiving waters. However, the objective of this policy is not to meet specific reductions of targeted pollutants, but rather to provide an effective level of pollutant removal by using reasonable, cost-effective BMP's. The goal is to minimize, to the extent practical, adverse impacts on the quality of these receiving waters.

Background - The Role of On-Site Water Quality Management Practices

It is important to recognize that the *structural* Best Management Practices for which design guidance is given herein represent only one aspect of storm water quality management. The most effective means of managing storm water quality are overall watershed planning, zoning controls, and other *nonstructural* practices which are generally beyond the control of an individual development.

The Fulbright Spring study concluded that a strategy based upon full development in a watershed, with reliance solely upon structural BMP's to maintain water quality, would not be successful. A combination of non-structural and structural

measures was recommended as the best means to manage the impacts of development on water quality.

Data from communities across the country has shown that, as the total impervious area within a watershed exceeds 10-15%, water quality declines, unless mitigative measures are taken. The most important management tool is to limit the impervious area in these watersheds. Since these limits may not be possible for individual developments or sub-basins, structural BMP's may be required for these developments.

GENERAL DESIGN GUIDELINES

1. Minimize the amount of runoff.

The total quantity of pollutants transported to receiving waters can be minimized most effectively by minimizing the amount of runoff. Both the quantity of runoff and the amount of pollutant wash-off can be minimized by reducing the amount of *directly connected impervious area (DCIA)*. Impervious areas are considered connected when runoff travels directly from roofs, drives, pavement, and other impervious areas to street gutters, closed storm drains or concrete or other impervious lined channels. Impervious areas are considered disconnected when runoff travels as sheet flow over grass areas, or through properly designed BMP's, prior to discharge from the site.

2. Maximize contact with grass and soil.

The opportunity for pollutants to settle can be maximized by providing maximum contact with grass and soil. Directing runoff over vegetative filter strips and grass swales enhances settling of pollutants as the velocity of flow is reduced.

3. Maximize holding and settling time.

The most effective runoff quality controls reduce both the runoff peak and volume. By reducing the rate of outflow and increasing the time of detention storage, settling of pollutants and infiltration of runoff is maximized.

4. Design for small, frequent storms.

Drainage systems for *flood control* are typically designed for large, infrequent storm events. In contrast, storm water

quality controls are designed for small, frequent storm events. In Greene County, 90% of all 24-hour rainfalls are 1" or less. Studies indicate that most pollutants are washed off in the "first flush", generally considered the first 1/2" of runoff.

5. **Utilize BMP's in series where possible.**

   Performance monitoring of BMP's in Florida, Maryland, and Delaware has shown that the combined effect of several BMP's in series can be more effective in reducing the level of pollutants than just providing a single BMP at the point of discharge. To the extent practical, impervious areas should be disconnected and runoff should be directed first to vegetative filter strips, then to grass swales or channels, and then to extended detention basins, sand filters, etc.

6. **Incorporate both flood control and storm quality objectives in designs, where practical.**

   Incorporating both flood control and water quality enhancement into a single storm water management facility is encouraged whenever practical. Combining several objectives, such as water quality enhancement and flood control, maximizes the cost-effectiveness of storm water management facilities.

REQUIREMENTS

Water quality BMP's shall be designed to reduce the pollutants to the maximum extent practical from runoff resulting from the greater of either the 90^{th} percentile rainfall over the entire development, or from the first flush rainfall from all impervious area within the development.

The following requirements will apply to any new development within the Fulbright Spring or Pierson Creek watersheds and for any new developments which discharge to sinkholes:

1) Storm water runoff from any new development for which the new impervious area exceeds 10% of the total land area of the development, must be directed through an extended wet or dry detention basin, or other properly designed BMP, prior to being discharged from the site.

2) Runoff from fueling areas, and other areas having a high concentration of pollutants will be required to be directed

to a properly designed BMP which provides filtration, as well as settling, prior to discharge to receiving waters.

3)The required water quality volume to be used in design of extended wet and dry detention basins and other BMP's shall be the greater of the following:

a) the first 1/2 inch of runoff from the directly connected impervious area in the development, or

b) the *runoff* resulting from a rainfall depth of 1 inch in 24 hours over the entire development.

DESIGN CRITERIA

Directly Connected Impervious Area (DCIA)

Impervious areas are considered connected when runoff travels directly from roofs, drives, pavement, and other impervious areas to street gutters, closed storm drains or concrete or other impervious lined channels.

In order for an impervious area to be considered disconnected, runoff from the area must pass through a vegetative filter strip or other BMP meeting the requirements set forth in this section.

For determining the amount of impervious area, the following assumptions shall apply in the absence of more detailed data:

Single Family Areas

Average roof area:	2500 sq.ft.
Average drive area:	800 sq.ft.
Average impervious area per lot:	3500 sq.ft.

Duplexes and Patio Homes

Average roof area:	2500 sq.ft.
Average drive area:	1600 sq.ft.
Average impervious area per lot:	4500 sq.ft.

When gutter down spouts for single-family and duplexes are directed to drain toward lawn areas, 75% of the roof area shall be considered disconnected.

Multi-Family, Commercial and Other Areas

The amount of impervious area contained in multi-family, commercial, office, and manufacturing developments shall be determined based upon the maximum impervious area allowed by zoning for the development.

Vegetative Filter Strips

Vegetative filter strips shall consist of areas of vegetation in good condition, including trees, grass, or other vegetative cover which meet the objectives for this BMP.

Vegetative filter strips shall be provided in areas of sheet flow only. The hydraulic loading for filter strips shall not exceed 0.05 cfs per lineal foot of filter strip length for the 50% AEP (2-year) storm.

The minimum width of a filter strip between the impervious area and the collection swale shall not be less than 20% of the length of the sheet flow from the upstream impervious surface, and in no case shall the filter strip be less than 6 feet. The slope along the width of the filter strip shall not exceed 4:1 (25%).

Grass Swales

Grass swales may be provided to convey runoff from vegetative filter strips and impervious areas to BMP's designed for capture and temporary storage of runoff.

Grass swales shall meet the following minimum criteria:

Maximum water depth: 12" for the peak flow from the 50% AEP (2-year) storm.
Maximum side slopes: 4:1
Maximum longitudinal slope: 5%.
Minimum longitudinal slope: 1%.
Maximum velocity: 2 feet per second for peak flow from the 50% AEP (2-year) storm.

Roughness coefficients for use in the design of grass swales shall be determined as set forth for determining detention volumes.

Grass swales shall be lined with sod or seeded and covered with suitable erosion control blanket and mulch until established.

Extended Dry Detention Basins

Extended dry detention basins may be provided to capture and provide temporary storage for the required water quality capture volume. Extended dry detention basins shall be placed outside of the primary watercourses which allow off-site flows to pass through the development where possible.

Design criteria for extended dry detention basins shall be as follows:

Volume: Minimum volume shall be 125% of the required water quality capture volume (WQCV). Detention basins for water quality may be combined with detention basins for flood control. Effects of the WQCV may be considered in the design for flood control.

Drain time: The WQCV shall be released over a minimum period of 40 hours and a maximum period of 72 hours.

Outlet structure: Outlet structures shall consist of a perforated riser pipe, outlet pipe, and gravel filter material. The minimum allowable riser pipe diameter is 8". The riser pipe shall be connected to an outlet pipe of equal of greater diameter. The outlet pipe shall have adequate capacity to carry the maximum rate of flow from the riser pipe. Material for the riser pipe shall be Schedule 40 PVC, ductile iron, or corrugated, galvanized metal.

A removable cap shall be provided at the top of the riser pipe. The cap shall have a 1" diameter hole for air relief.

The outlet pipe shall be bedded in firmly compacted clay, free of stones. For dams exceeding 10 feet in height, an anti-seep collar shall be provided around the pipe.

The number of rows of perforations, the number of perforations per row and the diameter of perforations for the riser pipe shall be specified on the plans. The perforation pattern shall be determined based upon orifice calculations to provide for release of the WQCV over the specified time. Perforations shall meet the following requirements:

Minimum perforation diameter:	1/4 inch
Maximum perforation diameter:	1 inch
Minimum number of holes per row:	4
Maximum number of holes per row:	8
Minimum row spacing:	4 inches
Maximum row spacing:	12 inches

Freeboard: Where the basin is to be utilized as a water quality BMP only, 12" minimum freeboard shall be provided above the WQCV.

Forebay: It is preferred that a forebay be provided to dissipate energy from incoming flows and to trap settleable sediment entering the basin. The forebay should be separated from the remainder of the basin by an earthen dike. The top of the dike shall be set 6" above the stage of the WQCV. Outflow from the forebay to the basin shall be through a gravel filter. The top of the gravel filter shall be set equal to the stage of the WQCV.

The volume of the forebay shall be a minimum of 10% and a maximum of 20% of the WQCV. The volume of the forebay is considered to be part of the required WQCV, not additional volume.

General construction requirements: The optimal length to width ratio for a water quality detention basin is 4 where length is defined as the shortest line between the inlet and the outlet. The length to width ratio should be no less than 2. The minimum allowable length to width ratio is 1. Side slopes, dams or dikes, and retaining walls shall meet the requirements for detention basins.

Overflow spillways: Where the basin is to be utilized as a water quality BMP only, a spillway or outlet structure,

capable of passing the peak flow from a 1% AEP (100-year) storm for the drainage area upstream of the basin, shall be provided. The lowest point on the spillway or outlet structure shall be set at the top of the WQCV.

Trickle channels: Trickle channels made from concrete or other acceptable material shall be provided to provide grade control and to minimize wet areas.

Extended Wet Detention Basins

Extended wet detention basins may be provided to capture and provide temporary storage for the required water quality capture volume. Extended wet detention basins shall be placed outside of the primary watercourses which allow off-site flows to pass through the development where possible.

Design criteria for extended wet detention basins shall be the same as for extended dry detention basins, with the following exceptions:

The volume of the permanent pool should not be less than 1.0 to 1.5 times the WQCV.

A bench area (littoral zone) with a width of 10 feet and a maximum slope of 4 to 1 and depth of 18 inches shall be provided around the permanent pool area. It is preferred that emergent aquatic vegetation be provided in this zone.

It is required that a minimum of 25% and a maximum of 50% of the WQCV be provided in the upper 18" of total permanent pool volume.

Depth of the principal portion of the permanent pool shall be a minimum of 4 feet.

It is preferred that a forebay, meeting the same requirements as specified for dry detention basins, be provided.

An anti-seep collar must be provided around the outlet pipe.

Where perforated riser pipes are not encased in gravel, only corrugated metal or ductile iron pipe may be used.

Other Structural BMP's

Constructed wetlands, porous pavements, and other structural BMP's for which detailed design criteria can be documented in generally accepted literature can be provided in addition to, or in lieu of, the BMP's described above, provided the objectives of this policy can be met. Infiltration basins and trenches are not allowed due to possible adverse impacts on groundwater.

OPERATION AND MAINTENANCE

The City of Springfield provides no maintenance of water quality BMP's located on private property or within drainage easements. Maintenance shall be provided by the owner of the property upon which the BMP is located.

Extended detention basins and wetlands or other BMP's shall be maintained by a property owners' association.

Aff. Agcy. Noticed	N/A
Emergency Required	No
P. Hrngs. Required	No
Fiscal Note Required	No
Bd. Action Required	N/A

EXPLANATION TO COUNCIL BILL NO. 99 -

ORIGINATING DEPARTMENT: Public Works

PURPOSE: To adopt a Water Quality Protection Policy for the Fulbright Spring, Pierson Creek, and sinkhole watersheds.

BACKGROUND INFORMATION:

The Fulbright and Pierson Creek watersheds have been identified as valuable water resources and sources of our community's water supply. In addition, the karst topography of this region directly connects sinkholes to the shallow ground water system that supports the springs in this region. This policy is also being adopted by the county and was recommended by the Water Resources Task Force. The Permitting Process Users Group has reviewed and the Environmental Advisory Board and Planning and Zoning Commission recommended approval as part of their review of the Water Resources Task Force Report.

REMARKS:

The objective of this policy is to provide an effective level of pollutant removal by using reasonable, cost-effective Best Management Practices. The goal is to minimize, to the extent practical, adverse impacts on the quality of these receiving waters. The City of Springfield Design Standards for Public Improvements will be revised to include enclosed design criteria in the storm water section.

Submitted by:

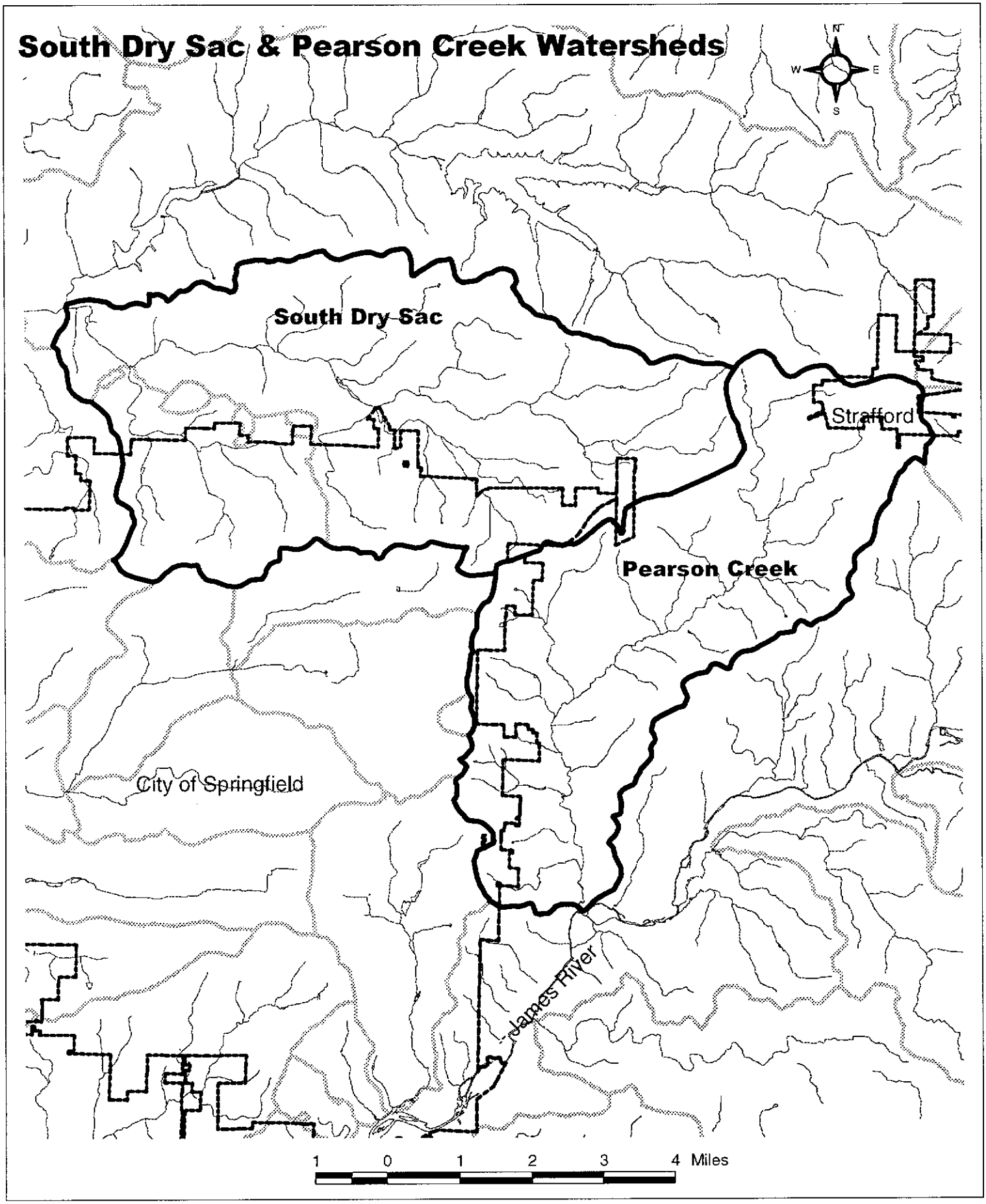
Michael J Gile
Principal Civil Engineer

Approved by:

Mark Thomsberry
Director of Public Works

Approved by:

City Manager


South Dry Sac & Pearson Creek Watersheds
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W
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South Dry Sac
Strafford
Pearson Creek
City of Springfield
James River
1 0 1 2 3 4 Miles